

ENTRY NO. **C 73** Date **October 3, 1995**  
 Name of Machine **Oak Ridge Isochronous Cyclotron ORIC**  
 Institution **ORNL Holifield Radioactive Ion Beam Facility HRIBF**  
 Address **P. O. Box 2008, Oak Ridge, TN 37831-6368 USA**  
 Tel **615-574-6122** Telex  Fax **615-574-1268** E-MAIL **OLSEN@ORIB01.PHY.ORNL.GOV**  
 In Charge: **D. K. Olsen** Reported by: **D. K. Olsen**

**HISTORY**  
**MILESTONE DATES:**  
 Design **1958** Model Tests **1958-59**  
 Construction **1958-1962** First Beam **1963**  
**DESIGN/CONSTRUCTION BY:**  
 in house  other   
**COST:** Accelerator **\$23M (1960)** Facility **\$90M total \$ 1995**  
**FUNDED BY:** DOE

**STATUS**  
**STAFF:** Machine for ORIC  
 Scientists **1** Engineers **3**  
 Technicians **4** Students **DOE**  
 Research (in house/external)  
 Scientists **/** Engineers **/**  
 Technicians **/** Students **/**  
**BUDGET:** Machine part of \$5M Funded by **DOE**  
 Research Funded by  
**TIME DISTRIBUTION:**  
 Basic Research (in house/external) **% / %**  
 Applied Program (in house/external) **% / %**  
 Maintenance **%** Development **%**

**MAGNET**  
**POLE PARAMETERS:**  
 Diameter **193** cm  $R_{extract}$  **77** cm  $R_{inject}$  **cm**  
**HILL PARAMETERS:** Gap (min) **19** cm  $B_{max}$  **2.37** T  
 (@ **1,600,000** AT) Gap (max) **71** cm  $B_{min}$  **1.40** T  
**VALLEY PARAMETERS:** Gap (min) **cm**  $B_{max}$  **T**  
 (@ **AT**) Gap (max) **cm**  $B_{min}$  **T**  
**AVERAGE FIELD:**  $\langle B \rangle_{min}$  **T**  $\langle B \rangle_{max}$  **1.92** T  
**NUMBER OF SECTORS:** compact/separated **3 /**  
 sector angle **deg** spiral (max) **30** deg.  
**FIELD TRIMMING:** Trim Coils **10** pairs  
 Harmonic Coils **3** pairs per valley  
 Other **1** pair per valley for flutter  
**CURRENT:** Main Coils **5000** Amps Stability  **$2 \times 10^5$**   
 Trim Coils **800** each Amps Stability  **$2 \times 10^4$**   
 Stored Energy (cryogenic) **MJ**  
**WEIGHT:** Iron **200** tons Conductor **9** tons  
**ION ENERGY:** Bending Limit  $E/A =$  **105** q<sup>2</sup>/A<sup>2</sup> MeV/u  
 Focusing Limit  $E/A =$  **75** q/A MeV/u

**ACCELERATION SYSTEM**  
**FUNDAMENTAL ACCELERATION:**  
 Description: **single 180 degree dee**  
 No. of Gaps/turn **2**  $dE/dn(max)$  **0.16** MeV/q  
 Voltage (max) **0.080** MV Harmonic  $f_r/f_{ion}$  **1,3**  
 Freq **6.7 to 20.1** MHz Power in(max) **0.20** MW  
 Stability: Phase **+/- 1 degree** Voltage **+/- 40V**  
**OTHER CAVITIES (Flattopping or otherwise):**  
 Description:  
 Region of Influence:  $R_{min}$  **cm**  $R_{max}$  **cm**  
 No. of Gaps/turn **dE/dn(max)** **MeV/q**  
 Voltage (max) **MV** Harmonic  $f_r/f_{ion}$   
 Freq **MHz** Power in(max) **MW**  
 Stability: Phase **Voltage**

**VACUUM SYSTEM**  
**OPERATING PRESSURE:**  **$1 \times 10^{-6}$  Torr**  
**PUMPS:** (No. and type) **two 80-cm and one 50-cm**  
**oil diffusion pumps**

**ION SOURCE(S)**  
 Type Intensity @  $\epsilon_n = \beta\gamma\epsilon$  Ion Species  
 (mA) ( $\pi$  mm mrad)  
 (a) **Internal Penning** **H and He gas**  
 (b)  
 (c)  
 (d)

**INJECTION SYSTEM**  
 Internal Ion Source Efficiency **%**

**EXTRACTION SYSTEM**  
 One electrostatic deflector Efficiency **65 %**  
 Two magnetic channels

**CHARACTERISTIC BEAMS**  
 Current (part  $\mu$ A)  

Accelerated Ions	E/A (MeV/u)	Internal	External
(a) Protons	60	6	2
(b) H, D, 4He	25	6	2
(c) 3He	44	6	2
(d)			

Secondary Particles	E (MeV)	part/sec
(a)		
(b)		
(c)		

**EXTRACTED BEAM PROPERTIES:**  
 For  $\mu$ A of **MeV/u** ions  
 $\Delta E/E$  **%**  $\Delta\phi$  **rf**  
 $\epsilon_n = \beta\gamma\epsilon$   **$\times$**   $\pi$  mm mrad **z**  $\pi$  mm mrad

**FACILITIES FOR RESEARCH**  
**SHIELDED AREA:** Fixed: **m<sup>2</sup>** Moveable **m<sup>2</sup>**  
 Target Stations: **No.** Served At Same Time:  
**MAGNETIC SPECTROMETERS:**  
**OTHER FACILITIES:**  
 ORIC is used as a driver for a RIB facility

**REFERENCES/NOTES**  
 (a)  
 (b)

**PLAN VIEW OF FACILITY, COMMENTS**  
 Have completed three-year reconfiguration and construction period to develop a radioactive ion beam facility with ORIC as a driver accelerator producing radioactive atoms and the 25URC 25MV tandem as a RIB accelerator. ORIC is being developed to produce 50 uA beams.